Phytochemistry of the Genus *Mimusops*

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Summary: The present review covers all the chemical constituents isolated from the genus *Mimusops* during the period 1974-1994.

Introduction

The genus *Mimusops* belongs to the family Sapotaceae and comprises of 30 species which are distributed in the tropical parts of the hemispheres. Of these five including *M. elengi, M. hexandra* and *M. manilkara* are indigenous to the subcontinent. The first two are important for their edible fruits [1,2] while *M. elengi* draws further attention due to its sweet scented flowers.

Various parts of *M. elengi, M. hexandra* and *M. manilkara* find similar uses in indigenous system of medicine [3-6] but the parts of *M. elengi* are more frequently used. Its dried flowers induce discharges from the nose and relieves headache. The ripe fruits are used for making preserves and pickles. Both fruits and barks are astringent and tonic; they are used in diarrhea and dysentery. The decoction of the bark is also used as a gragle. Pounded seeds of *M. elengi* pasted with oil or ghee are used in suppositories in case of obstinate constipation. The bark of *M. hexandra* is reported to be febrifuge and retards fermentation. Its seeds oil is demulcent and emollient. The saponins extracted from various parts of *M. hexandra* and *M. littoralis* exhibit spasmolytic activity [7] while saponins obtained from their seeds show spermicidal activity [8]. The saponins of the kernels of *M. manikara* show significant activity against carragenin-induced odema both on intraperitoneal and oral administration and inhibits formaldehyde-induced arthritis.

Misra *et al.*, have reviewed the chemical studies carried out on various species of *Mimusops* upto the year 1974 [9]. During that period chemical investigations were mainly confined to *M. hexandra, M. elengi, M. manilkara* and resulted in the isolation and identification of sugars, amino

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Table

	Compound (Str. No.) Mol. Formula Mol. Weight	Physical Data	Source	Ref.
1.	α-Amyrin $C_{30}H_{50}O$ 426	$[\alpha]_D$ +90° ($CHCl_3$) M.P. = 184-85°	*litto.*	[10]
2.	β-Amyrin $C_{30}H_{50}O$ 426	$[\alpha]_D^{19}$ +99.8° (C_6H_6) M.P. = 197.5°	*litto.*	[11]
3.	β-Amyrin caproate (1) $C_{36}H_{60}O_2$ 524	$[\alpha]_D$ M.P. = 158-60°	*litto*	[10]
4.	Arginine $C_6H_{14}O_2N_2$ 174	$[\alpha]_D^{20}$ +11.37° M.P. = 207° (dec.)	*zey.*	[12]
5.	Bassic acid $C_{30}H_{46}O_5$ 486	$[\alpha]_D$ +82.4-82.9° (pyr.) M.P. = 319.24°	*litto.*	[11]
6.	Dihydromalvalic acid $C_{18}H_{34}O_2$ 282	$[\alpha]_D$ - M.P. = -	*comm.*	[13]
7.	Dihydroquercitin (2) $C_{15}H_{12}O_7$ 304	$[\alpha]_D^{16}$ +41° M.P. = 236-38°	*litto.*	[14]
8.	Dihydrosterculic acid $C_{19}H_{36}O_2$ 296	$[\alpha]_D$ - M.P. = -	*comm.*	[15]
9.	Ellagic acid $C_{14}H_6O_8$ 302	$[\alpha]_D$ - M.P. = >360°	*litto*	[16]
10.	Gallic acid $C_7H_6O_5$ 170	$[\alpha]_D$ - M.P. = 253°	*litto.*	[16]
11.	Gallic acid Me-ester $C_8H_8O_5$ 184	$[\alpha]_D$ - M.P. = 157°	*litto.*	[16]
12.	Hexacosane $C_{26}H_{54}$ 366	$[\alpha]_D$ - M.P. = 56.4°	*litto.*	[10]
13.	Histidine $C_6H_9O_2N_3$ 155	$[\alpha]_D^{20}$ - 39.74°(H_2O) M.P. = -	*zey.*	[12]
14.	3β-Hydroxy-lup-(3) 20(29)-ene-23,28-dioic acid $C_{30}H_{46}O_5$ 486	$[\alpha]_D^{25}$ +30° (c, 0.52, $CHCl_3$) M.P. = 262-64°	*elen.*	[17]
15.	Isoleucine $C_6H_{13}O_2N$ 131	$[\alpha]_D^{20}$ -12.2° (c, 3.2, H_2O) M.P. = 283-84° (dec.)	*zey.*	[12]
16.	Leucine $C_6H_{13}O_2N$ 131	$[\alpha]_D^{20}$ + 11.1° (H_2O) M.P. = 293°	*zey.*	[12]
17.	Lupeol acetate (4) $C_{32}H_{52}O_2$ 468	$[\alpha]_D$ +41° ($CHCl_3$) M.P. = 214-16°	*litto.*	[18]
18.	Lysine $C_6H_{14}O_2N_2$ 146	$[\alpha]_D^{28}$ +24° (c, 1.1,1N HCl) M.P. = -	*zey.*	[12]
19.	Methionine $C_5H_{11}O_2NS$ 149	$[\alpha]_D^{25}$ -6.87° (H_2O) M.P. = 283° (dec.)	*zey.*	[12]
20.	Niacin $C_6H_5O_2N$ 123	$[\alpha]_D$ - M.P. = 236°	*zey.*	[12]

Table (cont.)

	Compound (Str. No.) Mol. Formula Mol. Weight.	Physical Data	Source	Ref.
21.	Octacosanol $C_{28}H_{58}O$ 410	$[\alpha]_D$ - M.P. = 83.2-83.4°	*litto.*	[10]
22.	Phenylalanine $C_9H_{11}O_2N$ 165	$[\alpha]_D$ - M.P. =283-84° (dec.)	*zey.*	[12]
23.	Polymeric tannin	-	*litto.*	[16]
24.	Protobassic acid (5) $C_{30}H_{48}O_6$ 504	$[\alpha]_D$ - M.P. = 310-12°	*litto.*	[19]
25.	Quercitin (6) $C_{15}H_{10}O_7$ 302	$[\alpha]_D$ - M.P. = 305-08°	*litto.*	[14]
26.	Riboflavine $C_{17}H_{20}O_6N_4$ 376	$[\alpha]_D$ -9.8° (H_2O) M.P. = 271° (dec.)	*zey.*	[12]
27.	β-Sitosterol-β-D-glucoside (7) $C_{35}H_{60}O_6$ 576	$[\alpha]_D$ -49.5° M.P. = 286°	*litto.*	[10]
28.	5α-Stigmast-9(11)-ene-3-O-β-D-gluco-pyranoside (1-5)-O-β-D-xylofuranoside (9) $C_{40}H_{68}O_{10}$ 708	$[\alpha]_D$ - M.P. = 263-65°	*elen.*	[20]
29.	(*24R*)-Stigmast-7,22(*E*)-dien-3α-ol (10) $C_{29}H_{48}O$ 412	$[\alpha]_D^{20}$ + 50° (c, 0.4, $CHCl_3$) M.P. = 150-52°	*elen.*	[21]
30.	(*24R*)-Stigmast-7,22(*E*)-dien-3α-ol β-D-galacto-pyranoside (11) $C_{35}H_{58}O_6$ 574	$[\alpha]_D^{20}$ -9.4° (c, 0.5, $CHCl_3$/MeOH) M.P. = 291°	*elen.*	[21]
31.	(*24R*)-Stigmast-7,22 (*E*)-dien-3α-ol β-D-gluco-pyranoside (12) $C_{35}H_{58}O_6$ 574	$[\alpha]_D^{20}$ - 15.9° (c, 0.11, $CHCl_3$/MeOH)	*elen.*	[21]
32.	Taraxeryl lignocerate (13) $C_{54}H_{96}O_2$ 776	$[\alpha]$ - M.P. = 178-80°	*litto.*	[10]
33.	Taraxerone (14) $C_{30}H_{48}O$ 424	$[\alpha]_D$ 11° (c, 1.29, $CHCl_3$) M.P. = -	*litto.*	[10]
34.	Taraxerol Me-ether (15) $C_{31}H_{52}O$ 440	$[\alpha]_D \pm 0°$ M.P. = 280-82°	*litto.*	[18]
35.	Threonine $C_4H_9O_3N$ 119	$[\alpha]_D^{26}$ -28.3° M.P. = 251-53°	*zey.*	[12]
36.	Tiglate ester of (-)-Isoretronecanol (16) $C_{13}H_{21}NO_2$ 223	$[\alpha]_D$ - M.P. =	*elen.*	[22]
37.	Tiglate ester of laburnine (17) $C_{13}H_{21}NO_2$ 223	$[\alpha]_D$ - M.P. = -	*elen.*	[22]
38.	Tryptophan $C_{11}H_{12}O_2N_2$	$[\alpha]_D$ - M.P. = 278°	*zey.*	[12]

Table (cont.)

	Compound (Str. No.) Mol. Formula Mol. Weight	Physical Data	Source	Ref.
39.	Valine $C_5H_{11}O_2N$ 117	$[\alpha]_D$ - M.P. = 156-57.5°	*zey*	[12]

Vocabulary for Table

1. *Bal.* = *balata;* **2.** *comm.* = *commersonii;* **3.** *elen.* = *elengi;* **4.** *globo.* = *globosa;* **5.** *hexan.* = *hexandra;* **6.** *heck.* = *heckelii;* **7.** *litto.* = *littoralis;* **8.** *manil.* = *manilkara;* **9.** *zey* = *zeyheri.*

acids, free triterpenes and their esters, fatty acids, flavonoids, free sterols and their glycosides.

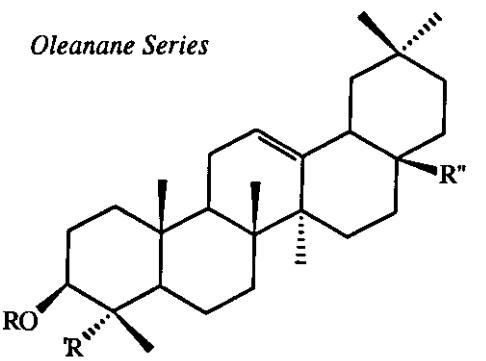
Since 1974, the chemical investigation on genus *Mimusops* have now been extended to nine species and the number of isolated compounds have reached such a magnitude to necessitate the publication of another review covering the period upto the end of 1994. The tabulated account is presented herein in the Table.

Results and Discussion

It has been observed that the pattern which was earlier noted by Misra *et al.*, in the case of *M. elengi, M. manilkara* and *M. hexandara* continue with other species and there is wide variation in the finding of various workers which might be due to seasonal variation. It is interesting to note from chemotaxonomic consideration that the free triterpenes and sterols have only been reported from *M. elengi* and *M. littolaris* while the other species contain their esters or glycosides. The ten common amino acids have been identified in *M. commersonii* while vitamins niacin and riboflavine have been reported only from *M. zeyheri.* It is also significant from biogenetic consideration that apart from free and esterified fatty acids, a cyclopropanated fatty acids (Dihydromalvalic acid) has been reported from *M. commersonii.*

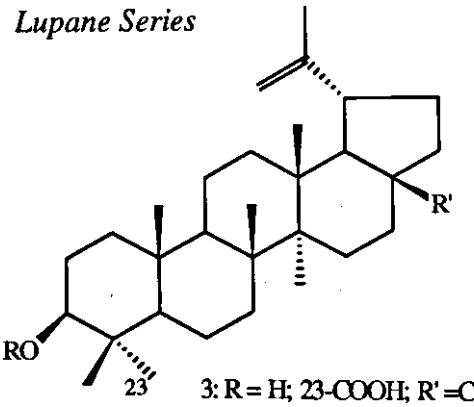
The easy availability and medicinal importance of *M. elengi* led us to carry out a bioassay directed isolation study on this species. The whole plant extract has been found to possess both hypertensive and hypotensive activities along with significants antiplatelet activity. The hexane soluble fraction of the total extract exhibited CNS and antiplatelet activity. The chloroform soluble fraction showed moderate hypotensive activity while the butanol fraction exhibited a pronounced hypotensive activity. From the hexane soluble fraction we have been able to isolate [17,21] two new steroidal glycosides namely(24R)-stigmast-7,22 (E)-dien-3α-ol β-D-glactopyranoside (11), (24R)-stigmast-7,22 (E)-dien-3α-ol β-D-glucopyranoside (12) and a new triterpene which could be charac-terized as a 3β-hydroxy-lup-20(29)-ene-23,28-dioic acid (3)

Oleanane Series



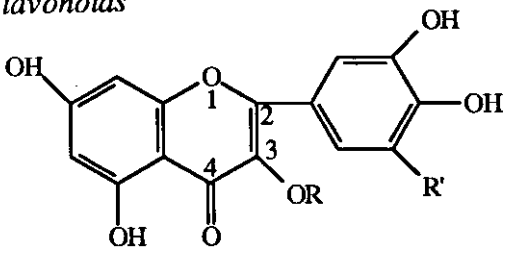
1: R', R" = CH_3, R = CO-C_5H_{11}
5: R = H; R' = CH_2OH; R" = COOH; 2β-& 6-OH

Lupane Series



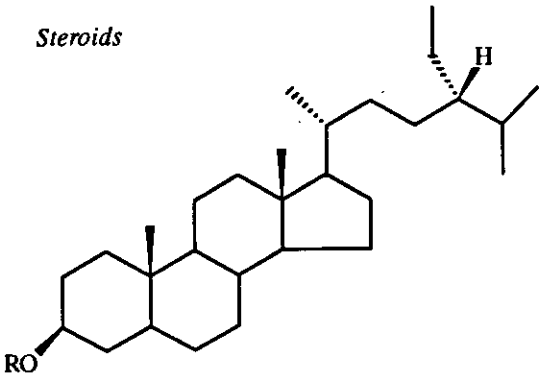
3: R = H; 23-COOH; R' = COOH
4: R = CO-CH_3; R' = CH_3

Flavonoids



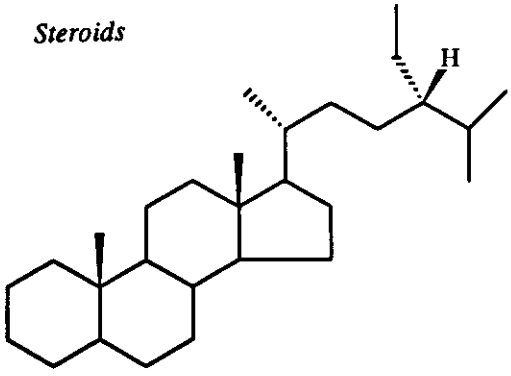
2: R, R' = H; 2,3, dihydro
6: R, R' = H

Steroids



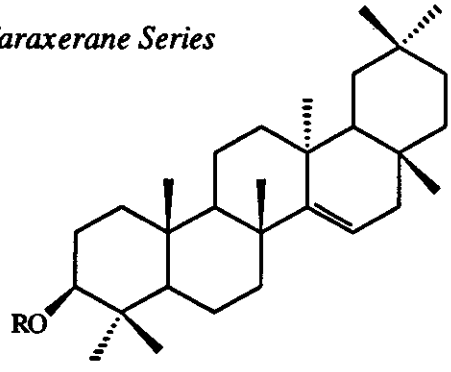
7: R = β-D-glucopyranosyl; Δ^5
9: R=β-D-glucopyranosyl-(1-5)-O-β-D-Xylofuronoside; Δ^9 (11)

Steroids



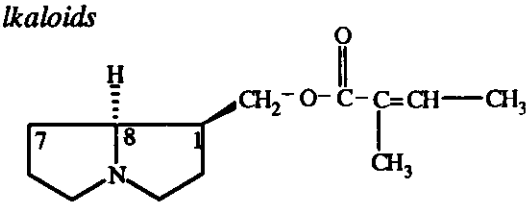
8: 3β Hydroxy Δ^5
10: 3α Hydroxy $\Delta^{7,22}$
11: 3-O-β-D-Galactopyranoside of (10)
12: 3-O-β-D-Glucopyranoside of (10)

Taraxerane Series



13: R = CO-$C_{23}H_{47}$
14: R = O
15: R = CH_3

Alkaloids



16: Tiglate ester of Isoretronecanol (1S, 8S-form)
17: Tiglate ester of Labumine (1S, 8R-form)

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